October 31, 2002

MEMORANDUM TO: John A. Nakoski, Section Chief
Project Directorate II-1
Division of Licensing and Project Management
Office of Nuclear Reactor Regulation

FROM: F. Mark Reinhart, Section Chief /**RA/** J. Lee for
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

SUBJECT: EVALUATION OF THE RISK INFORMATION USED TO SUPPORT THE CATAWBA REQUEST FOR TEMPORARY TECHNICAL SPECIFICATION CHANGES TO SEVERAL SYSTEMS (INCLUDING EMERGENCY CORE COOLING, CONTAINMENT SPRAY, AUXILIARY FEEDWATER AND COMPONENT COOLING) IN ORDER TO REPLACE A PORTION OF THE NUCLEAR SERVICE WATER SYSTEM AFFECTING BOTH CATAWBA UNITS (TAC NO. MB6311 and MB6312)

The Probabilistic Safety Assessment Branch (SPSB) reviewed the risk assessment information submitted by Duke Energy Corporation in support of several requested temporary technical specification (TS) changes for Catawba Nuclear Station, Units 1 and 2. These changes are needed to replace part of the nuclear service water system (NSWS) piping. Detailed work planning indicated that the scope of activities is such that the work could not be completed within the 72-hour Required Action time frame that TS allow. Therefore, it was decided to request a four-day extension of the TS Required Action time frame (i.e., a total outage of up to seven days) to allow adequate time for this work to be completed.

SPSB concludes that the risk information included in the Catawba application supports the proposed temporary (one time) completion time (CT) extensions from 72 hours to seven days, assuming the specific monitoring and compensatory measures listed in the submittal will be properly implemented. The SPSB input to the safety evaluation (SE) is attached.

Attachment: As stated

CONTACT: N. Saltos NRR/DSSA/SPSB
415-1072

cc: Chandu Patel

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Attachment: As stated

CC: Chandu Patel

Accession #:ML023080430

*See previous concurrence
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OFFICE RECORD ONLY

EVALUATION OF THE RISK INFORMATION USED TO SUPPORT THE CATAWBA REQUES FOR TEMPORARY TECHNICAL SPECIFICATION CHANGES TO SEVERAL SYSTEMS (INCLUDING EMERGENCY CORE COOLING, CONTAINMENT SPRAY, AUXILIARY FEEDWATER AND COMPONENT COOLING) IN ORDER TO REPLACE A PORTION OF THE NUCLEAR SERVICE WATER SYSTEM AFFECTING BOTH CATAWBA UNITS (TAC NO. MB6311 and MB6312)

1.0 INTRODUCTION

Duke Energy Corporation submitted risk information in support of the several requested temporary technical specification (TS) changes for Catawba Nuclear Station, Units 1 and 2. These temporary changes are needed to replace part of the nuclear service water system (NSWS) piping. Internal inspection of the NSWS piping, performed while work was being done to upgrade the NSWS (NRC issued related TS amendment on October 4, 2000), it was found that an approximately 20-feet section of the "A" NSWS header is undergoing degradation. Although the integrity of the affected section is not in jeopardy at this time, the concern is that over time the pipe will degrade and eventually begin to leak. Plant personnel have evaluated several options to address this degradation and have determined that replacement of the affected section is the preferred course of action. Detailed work planning indicated that the scope of activities is such that the work could not be completed within the 72-hour Required Action time frame that TS allow. Therefore, it was decided to request a four-day extension of the TS Required Action time frame (i.e., a total outage of up to seven days) to allow adequate time for this work to be completed.

The project to replace the degraded section of the "A" train of the NSWS will require an excavation area of considerable size to achieve personnel safety requirements. Since the "B" train is located approximately four feet away from the "A" train, there will be a time period during which portions of both trains will be uncovered. Therefore, compensatory measures for missile protection will be in place to ensure proper protection. The proposed changes to TS requirements provide the operational flexibility necessary to perform the NSWS pipe replacement with both units operating at power. During the time period that the "A" NSWS header will be inoperable, the "B" NSWS header and associated support systems will remain operable. In this configuration, the operable loop will still respond as designed during design basis events.

2.0 PROPOSED CHANGES

Duke Energy Corporation requests a temporary (one time) extension of the TS completion time (CT) from 3 to 7 days for the systems listed below to allow operation of the NSWS, with one train inoperable on both units, for a period of seven days:

- Emergency core cooling system (ECCS) --- TS 3.5.2
- Containment spray system (CSS) --- TS 3.6.6
- Auxiliary feedwater system (AFW) --- TS 3.7.5
- Component cooling water (CCW) system --- TS 3.7.7

- Nuclear service water system (NSWS) --- TS 3.7.8, and
- AC sources (associated “A” diesel generators EDGs) --- TS 3.8.1

The above TS changes will allow the NSWS header “A” for each unit to be taken out of service for up to seven days for pipe replacement.

3.0 RISK ASSESSMENT EVALUATION

In evaluating the risk information submitted by the licensee, the three-tiered approach documented in RG 1.177, “An approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications,” was followed. The first tier of the three-tiered approach includes the assessment of the risk impact of the proposed change for comparison to acceptance guidelines consistent with the Commission’s Safety Goal Policy Statement, as documented in Regulatory Guide (RG) 1.174 entitled “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis. ”In addition, the first tier aims at ensuring that the plant risk does not increase unacceptably during the period the equipment is taken out of service. The second tier addresses the need to preclude potentially high risk configurations which could result if equipment in addition to that associated with the change are taken out of service simultaneously. The third tier addresses the establishment of an overall configuration risk management program (CRMP) for identifying risk significant configurations resulting from maintenance or other operational activities and taking appropriate compensatory measures to avoid such configurations.

3.1 Quality of Risk Assessment

The licensee used its PRA model to assess the risk associated with taking the “A” loop of the NSWS for each unit out of service for up to seven days (four days beyond its current TS limit of 72 hours). The risk assessment has taken some credit for the compensatory actions that are to be implemented during the proposed NSWS outage. For example, it was assumed that there will be no planned outage of several risk-significant equipment, such as the redundant trains of the safety-related systems, during the NSWS outage. In addition, the licensee used its PRA to identify dominant contributing sequences to the estimated increase in risk as well as major contributing failures and human errors. Insights from the risk assessment were used in identifying appropriate monitoring and compensatory measures. For example, the risk assessment identified a flooding initiating event in the Turbine Building (TB) as a dominant risk contributor when the “A” loop of NSWS is unavailable. To reduce this risk, the licensee committed to avoid any planned maintenance of the condenser circulating water system in both units, the major source of flooding in the TB.

In support of a previous similar amendment request to upgrade the NSWS (NRC issued related TS amendment on October 4, 2000), the licensee submitted dominant sequences and cutsets contributing over 90% to the estimated increase in risk. The staff evaluated the quality of this information by comparing it to applicable findings from the staff‘s review of the PRA (developed as part of licensee’s individual plant evaluation (IPE)) as well as to findings for similar plants and found it acceptable.

3.2 Risk Impact of the Proposed Change (Tier 1)

An acceptable approach to risk-informed decision making is to show that the proposed change to the licensing basis meets several key principles (RG 1.174). One of these principles is to show that the proposed change results in an increase in risk, in terms of core damage frequency (CDF) and large early release frequency (LERF), which is small and consistent with the Commission's Safety Goal Policy Statement. Acceptance guidelines for meeting this principle are presented in RG 1.174. Although the RG 1.174 refers to permanent changes to the licensing basis while the licensee proposes a temporary change to allow an one-time AOT extension for each NSWS train, guidance provided in RG 1.174 can be used to show that the proposed change results in an increase in risk which is small and consistent with the Commission's Safety Goal Policy Statement.

The licensee used its PRA model of the plant to calculate the following risk increases due to the proposed temporary change:

- The mean core damage frequency (CDF) associated with both units will increase by about 2.6E-6/year (i.e., about 1.3E-6 per year per unit) during the one-year period following implementation of the four-day NSWS train outage extensions.

- The mean large early release frequency (LERF) associated with both units will increase by less than 1E-7/year during the one-year period following implementation of the
- four-day NSWS train outage extensions.

According to the guidelines of RG 1.174, the estimated increases in the mean values of CDF and LERF are of low to moderate risk significance. However, if several recently implemented improvements in both design and operations are taken into consideration, the actual net risk increase for the plant during the one-year period following implementation of the four-day NSWS train outage extensions will be insignificant or the plant risk may actually decrease. For example, Catawba recently installed reactor coolant pump (RCP) seals which are qualified for higher temperatures. Using the current Catawba PRA model, the licensee estimated that this modification alone has reduced the plant CDF by approximately 16%.

In addition to changes in the mean values of CDF and LERF, the incremental conditional core damage probability (ICCDP) and the incremental conditional large early release probability (ICLERP) were assessed. These quantities are a measure of the increase in probability of core damage and large early release, respectively, during a single outage assumed to last for the entire duration allowed by the proposed change.

- ICCDP: 2.6E-6 (1.3E-6 per unit)

- ICLERP: less than 5E-8

These values were compared with the acceptance guidance criteria of 5E-7 for ICCDP and 5E-8 for ICLERP, respectively, outlined in RG 1.177. This comparison shows that the value of ICCDP is somewhat higher than 5E-7 while the value of ICLERP indicates a small risk impact. However, the value of ICCDP would most likely be significantly smaller should the effects of many non-quantified monitoring and compensatory measures (e.g., during the seven-day period the operable trains will be considered protected trains and all routine monitoring will be

increased) had been considered. For the above reasons and the fact that the proposed TS change is non-permanent, the plant risk will not increase unacceptably.

3.3 Avoidance of High Risk Plant Configurations (Tier 2)

The licensee used its PRA to identify dominant contributing sequences and associated cutsets to the estimated increase in risk as well as major contributing failures and human errors. Insights from the risk assessment were used in identifying the monitoring and compensatory measures (listed in the submittal on pages 3-13 and 3-14) to avoid high risk plant configurations during outage of the NSWS "A" train of each Catawba unit. The staff finds that the proposed precautions, as well as their proposed implementation, are adequate for preventing the identified high risk plant configurations.

3.4 Risk-Informed Configuration Risk Management (Tier 3)

The intent of the risk-informed configuration risk management is to ensure that plant safety is maintained and monitored during an extended outage. A formal commitment to maintain a configuration risk management program (CRPM) is required on the part of a utility prior to implementation of a risk-informed TS whenever such TS is entered and risk-significant components are taken out of service. Licensees have programs in place to comply with 10 CDF 50.65(a)(4) to assess and manage risk from proposed maintenance activities. These programs can support licensee decisionmaking regarding the appropriate actions to control risk whenever a risk-informed TS is entered.

4.0 CONCLUSION

The staff expects the licensee to implement the proposed temporary TS changes in accordance with the three-tiered approach described above, including implementation of the specific monitoring and compensatory measures listed on pages 3-13 and 3-14 of the submittal. The staff concludes that the results and insights of the risk analysis supports the proposed temporary CT extensions from 72 hours to seven days.